Vertex Form

$$y = a(x-h)^2 + k$$

Ex/ Describe the transformations to $y = x^2$ and then for each identify:

    i) The direction of opening.
    ii) The axis of symmetry.
    iii) The vertex.
    iv) The number of zeros.
    v) The y-intercept.

a) $y = x^2 - 3$

    - Down 3

    i) up (positive x^2)

    ii) $X = 0$

    iii) $(0, -3)$

    iv)

    2 zeros

    v) $X = 0$, $y = 0^2 - 3$
         $= -3$

b) $y = -2(x-1)^2$

    - Vertical reflection
    - Vertical stretch by 2
    - Right 1

    i) Down

    ii) $X = 1$

    iii) $(1, 0)$

    iv)

    1 zero

    v) $X = 0$, $y = -2(0-1)^2$
                 $= -2(-1)^2$
                 $= -2(1)$
                 $= -2$

c) $y = 3(x+2)^2 - 4$

    - Vertical stretch by 3
    - Left 2
    - Down 4

    i) Up

    ii) $X = -2$

    iii) $(-2, -4)$

    iv)

    2 zeros

    v) $X = 0$, $y = 3(0+2)^2 - 4$
                 $= 3(2)^2 - 4$
                 $= 3(4) - 4$
                 $= 8$

Ex/ Write the equation for a quadratic that has been shifted 3 units right, reflected across the x-axis, shifted down 2, and vertically stretched by 5.

$$y = -5(x-3)^2 - 2$$

Ex/ Write the equation of a parabola that has a vertex at (-4,2), opens downward, and is wider than $y = x^2$.

$$y = -\frac{1}{4}(x+4)^2 + 2$$

any negative value between 0 and -1

- When graphing, identify the vertex first then plot additional points using the step pattern.
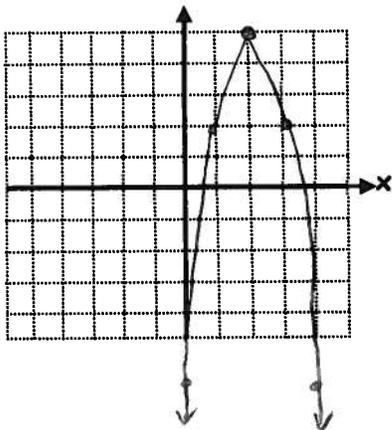
Ex/ Sketch the following by using the step pattern.

a) $y = -3(x-2)^2 + 5$
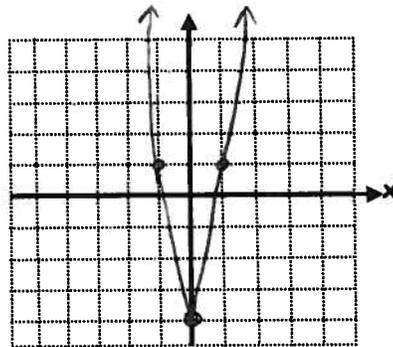
Vertex : $(2,5)$

Step : $-3(1,3,5)$

$= -3, -9, -15$

over 1, down 3
over 1, down 9

b) $y = 5x^2 - 4$

Vertex: $(0,-4)$
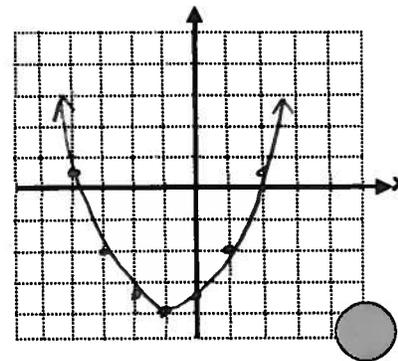
Step: $5(1,3,5)$

$= 5, 15, 25$

c) $y = \frac{1}{2}(x+1)^2 - 4$

Vertex : $(-1,-4)$

Step = $\frac{1}{2}(1,3,5)$

$= 0.5, 1.5, 2.5$

Homework: Pg. 269   #'s: 2,6,7ace,11,14